Research Paper | Health Science | E-ISSN No : 2454-9916 | Volume : 3 | Issue : 4 | Apr 2017

CORE UNDERGRADUATE OPTOMETRY COMPETENCIES: WHAT DO STUDENTS NEED TO KNOW?.

Guadalupe Rodriguez (Msc) [1,2] | Victoria de Juan Herraez (PhD) [1,3] | Sara Ortiz-Toquero (Msc) [1,2] | Raul Martin (PhD) [1,2,4]

[1] Optometry Research Group, IOBA Eye Institute. School of Optometry, University of Valladolid. Valladolid (Spain).

[2] Universidad de Valladolid. Departamento de Física Teórica, Atómica y Óptica. Paseo de Belén, 7 - Campus Miguel Delibes, 47011 VALLADOLID (España).

[3] Department of Ophthalmology. Hospital Ramon y Cajal. 28034 Madrid (España).

[4] School of Health Professions, Plymouth University. Derriford Road, Plymouth PL6 8BH (UK).

ABSTRACT

Objective: The purpose of this study was to define the core competencies to include in an undergraduate optometry placement program.

Methods: We selected a participatory 12-month action-research project approach to define a set of core competencies to drive the learning process during optometry placements. Four stages were scheduled; 1) literature review(focus group to define a list of competencies); 2) assessment by university optometry staff(one wave Delphi survey); 3) assessment by external stakeholders, [final year students(n=25), optometrists in practice (n=20) and members of The College of Optometrists Board (n=9)] prior to the development of placements (Likert scale, on-line questionnaire); 4) placement development and analysis including students' logbook reviews by the research team and students' and placement supervisors' feedback.

Results: 72 core competencies classified into 8 major units was proposed after the focus group analysis (General Optical Council (UK), ASCO (EEUU); Optometry Australia and The Canadian Examiners in Optometry mapping) with high levels of consensus between university staff members (Delphi survey) and external stakeholders. A competencies-based logbook was created and used during student placements yielding high levels of satisfaction amongst both students and supervisors (7.6±1.2 and 7.4±1.6 over 10 respectively).

Conclusions: This study demonstrates the use of a systematic method to objectively develop undergraduate core competencies by asking different external and internal university stake holders to identify competencies that are relevant in day-to-day professional practice. Similar methodology could be used in other programs, and provides rational and transparent means of developing competencies in the education of health care students.

KEY WORDS: Primary Care Education; Clinical Education; Qualitative Research Methods; Competency-Based Education.

Introduction

The World Council of Optometry defines 'optometry' as a healthcare profession and 'optometrists' as primary healthcare practitioners of the eye and visual system who provide comprehensive eye and vision care, which includes refraction and dispensing, detection/diagnosis and management of disease in the eye, and the rehabilitation of conditions of the visual system (www.worldoptometry.org). There is a wide variation of standards in optical and optometric qualifications in Europe. The 1999 Bologna Declaration developed the European Higher Education Area, which was a catalyst for the transformation of European university programs, harmonizing educational practice and promoting the free movement of practitioners. In Spain, optometrists are health care professionals, regulated by national laws that require a bachelor's program to register with the Spanish Council of Optics and Optometry. Following the Bologna process, the optometry program in Spain moved from a 3-year to a 4-year bachelor's degree that included, for the first time, a 300-hours of compulsory placement with a competencies-based approach (BOE 2009).

Competency-based education in health care professions has become a core strategy to educate and assess the next generation of practitioners (Hawkins et al. 2015).Main advantages of competency-based frameworks include: a) the use of a process-based structure and content; b) a focus on outcomes and learner achievements; c) the use of non-traditional lectures; d) the use of multifaceted observation-based assessment approaches(including formative assessment, support of flexible learning, and a time-independent trajectory along the educational process); and e) an increased transparency and accountability or all stakeholders, with a common language for education and assessment (Hawkins et al. 2015).

There is lack of consensus and consistency in the way competencies are defined, developed, implemented and assessed with considerable heterogeneity across different countries. (Hawkins et al. 2015; Gervais 2016)Within the optometric field, different competencies have been proposed by different regulatory bodies: the General Optical Council (in United Kingdom) (GOC 2016); the Association of Schools and Colleges of Optometry (ASCO)in EEUU (Smythe and Daum 2011); the Optometry Australia (Kiely and Slater 2015) and the Canadian Examiners in Optometry (www.ceo.eco.org). All defined a psychometrically valid and defensible assessment set of core competencies to establish entry requirements to practice optometry in each country. Other organizations such as The European Council of Optometry and Optics (www.ecoo.info) or The European Academy of Optics and Optometry (www.eaoo.info) have also provided a list of competencies or learning outcomes in optometry.

Unfortunately, the description of the competencies included in the Spanish's regulatory laws (BOE 2009) relating to the new 4-year optometry program is wide and undetailed. This difficulted their implementation by Universities creating the need to define optometry related competencies in more detail, especially those in relation to placement development.

The purpose of this study was to define a group of core competencies to include in the optometry program at the University of Valladolid, by asking final year students, optometrists in practice (non-University staff) and The College of Optometrist of Castilla y Leon Board which competencies are required in optometric day-to-day practice (using a triangulation approach).

Methods

We selected a participatory action-research design approach to define a group of competencies that would be able to drive learning processes during placements in the optometry program at the University of Valladolid.

Four faculty staff members formed the research team and took part in a 12-month process which included four action-research stages **(Table 1 and Figure 1):**

1) **Literature review of optometry core competencies** and posterior assessment by the optometry staff at the University of Valladolid. An extensive literature review oncore competencies defined to regulate optometric practice in different countries was conducted and discussed within a focus group (research team). The focus group aimed at providing a set of core competencies appropriate to the Spanish context that included professional settings and universities.

2) **Delphi wave.** Four different university optometry staff members assessed the list of competencies chosen after the focus group analysis in one Delphi survey wave. Delphi methodology has been used in the analysis of curriculum development in a range of healthcare environments and health services research (Hasson et al. 2000; Moynihan et al. 2015).

3) **Assessment of the chosen core competencies** prior to placements by external stakeholders involved: final year students, optometrists in practice and members of The College of Optometrist of Castilla y Leon Board (all practitioners were external to the University). An on-line questionnaire was designed to assess whether each competence should be included or not in the group of core competencies. The respondents designated a level of importance to each competency using a Likert scale with 5 levels; where: 1='Not Important At All'; 2='Of Little Importance'; 3='Of Average Importance'; 4= 'Very Important'; and 5= 'Absolutely Essential'.

4) **Placement development and review.** Each student undertook a placement period in a non-university optometry center under the supervision of a community registered optometrist. Using the information collected in the second phase of the study a 'practice logbook' was created and given to each student and placement supervisor. This logbook included the list of core competencies, the assessment rubric and the minimum number of patient experience that students had to achieve during the placement period.

After the end of the placement period, stakeholders (students and supervisors) were asked to complete a questionnaire anonymously (which included open and closed questions) to evaluate the levels of satisfaction and to collate feedback and ideas on how improve future placements. The research team also reviewed the students' logbooks in order to assess the achievement levels in each competency.

A total of 8 optometry staff from the University of Valladolid took part in this study. Four of them formed the research team and the remaining 4 participated in the Delphi survey. Four different external stakeholder groups were identified: a group of 25optometry students in the final year of the program (the full cohort); 20 optometrists in practice with more than 10 years' experience who voluntarily participated in the study; The College of Optometrist of Castilla y Leon Board (9 members with a wide range of experience in the field), and 25 placement supervisors (one supervisor for each student), chosen by the placement coordinator within the University of Valladolid. Each participant was involved in a different stage of the action-research study **(Table 1).**

Statistical analysis

Data collection considered quantitative and qualitative methods, including focus groups, individual online questionnaires (with open and closed questions), and analysis of students' placement logbooks. We used triangulation of participants' information in order to ensure credibility of the research process (Taber 2013).

The data were analysed using the Statistical Package for the Social Sciences (SPSS for Windows software, version 22.0, SPSS, Inc., Chicago, IL, USA). Normal distribution of variables was assessed using the Kolmogorov–Smirnov test (P values <0.05 indicated that the data were not normally distributed).Results of participants 'responses were presented as means ± standard deviation (SD), minimum and maximum, mode, interquartile range and 25th, 50th (median) and 75th percentiles. Differences between students, optometrists in practice and The College of Optometrist of Castilla y Leon Board's responses were analysed with non-parametric analysis of variance (Krustal-Wallis), where P-values<0.05 were considered statistically significant.

Results

1.- Literature review of optometry core competencies

The core competencies designed by the General Optical Council in the UK(GOC 2016), the ASCO in EEUU(Smythe and Daum 2011); the Optometry Australia(Kiely and Slater 2015) and the Canadian Examiners in Optometry (www.ceo.eco.org)were reviewed and summarised by the research team into72 competencies grouped in 8major units (Table 2)using a focus group discussion. The final set of core competencies were mainly based on the UK's General Optical Council principles because these are considered to provide the highest standards in optometric practice in Europe.

2.- Delphi survey

Four optometry lecturers assessed and accepted the core competencies in a single Delphi approach wave (no competencies were eliminated). All competencies were described in terms of 'student ability to do' highlighting the clinical approach and patient management.

3.- Assessment by external (non-university staff) stakeholders

The response from stakeholders concluded that just a few competencies were 'of little importance'or 'not important at all 'in optometric practice (less than 10%; Figure 2).Detailed analysis showed that most of these responses originated from students (Figure3). The responses from The College of Optometrist of Castilla y Leon Board showed higher scores than optometrist in practice and students, who provided the lowest scores in all competency units. These scores showed statistically significant differences (P<0.01Kruskal-Wallis ANOVA).Competency C4.7 (related to the management of low vision patients) was considered of 'little' or 'no' importanceby30% of students, 32% of optometrists and by 22% of The College's Board. Because the rest of competencies was mainly classified as 'of average importance' or higher, the research group decided to include allof the chosen competencies in the placement program. Table 3 summarizes the score provided by each stakeholder group for each competency unit.

4.-External placement development and posterior analysis

All students and placement supervisors used the placement logbooks to register student activities and patients' relevant and anonymized information. Logbook assessment carried out by the research team revealed that some relevant competencies (defined as 'very important' or 'absolutely essential' by all stakeholders) were not completed by more than 40% of students. For example, ability to examine the fundi (C 5.7) and the peripheral visual field investigation (C 5.9) were not achieved by 55% of students. Half of the student groupcould not recognize the main symptoms of retinal detachment (C 6.12)and 41% could not recognize the most common ocular manifestations in systemic disease (C 6.13). All of these competencies were considered essential in optometric practice (Figure 2). Another important area of underachievement of competencies was related to gas permeable contact lens fitting, where 41% of students were not able to choose the gas permeable lens parameters required to fit a given patient (C 7.5). The management of binocular vision disorders was another unit that showed low compliance; 45% of students were unable to manage a patient with heterophoria (C 8.4) and 40% were unable to detect (C 8.5) and manage (C 8.6) a patient with heterotropia. Other specialties, such as low vision (C 4.7) or complex contact lens fitting (C 7.9), showed less than 50% achievement.

We found high levels of satisfaction from students and placement supervisors (7.6±1.2 and 7.4±1.6 over 10 respectively) after placements. Both, students and supervisors, reported general consensus on the utility of the placement logbook to drive the students' learning process (86%) and as an aid for the supervisor's role (81%)highlighting that the descriptions of competencies was useful to improve students' learning during their placements (86% and 91% respectively).

However, both groups of stakeholders also highlighted that clinical practice should be increased in the optometry program (100% of students and 92% of supervisors)and 35% of students did not feel well prepared to carry outthe actual skills required in their placements.

Discussion

Although competency-based education has attracted great interest in recent years among educators and policy-makers in the health care professions, there is little agreement on many aspects of this paradigm (Frank et al. 2010).

The terms 'competence' and 'competency', have not been consistently defined by regulators and educators (Hawkins et al. 2015; Gervais 2016).A 'competent' professional is defined by the ability to perform the range of professional roles and activities at the required standard, combining knowledge, skills and attitudes(Kiely and Slater 2015; Shilton et al. 2001). Therefore, the term 'competence' describes overall professional ability and integrates capability and performance levels(Kiely and Slater 2015).In the same way, The European Council of Optics and Optometry defines 'competency' as the ability to perform the activities within an occupation to the standard expected in employment and 'competencies' as the skills, attitudes and knowledge needed in professional practice (ECOO 2012). Govaerts (2008) proposed that the concept of competency offers a common framework which employers, employees and educators alike can use as they confront the challenges that arise from recent socio-economic changes. This affects the optometry profession, as a primary eye care providers, and due to the wide variation of standards of optical and optometric qualifications in Europe, competencies-based education could aid the transformation and harmonization across optometry programs, expediting mobility of students and professionals across countries.

Since competencies are context-dependent, the first step of this project was focused on the deep analysis of previously described optometry competencies (GOC 2016; Smythe and Daum 2011; Kiely and Slater 2015) in different contexts in order to adapt them to the local necessities. A focus group was used followed by Delphi assessment. The action-research process provided a rich depiction of how content and process issues interact in competence-oriented learning during student placements(Taber 2013).The use of a logbook focused on competencies yielded high levels of satisfaction amongst stakeholders.

The major strength in this study lies in its rich description of core competencies to be attained and supervised during placements as they facilitate students' learning and clearly set objectives, enabling the supervisor's role, as recommended in medical education (Thistlethwaite et al. 2013). The triangulation of data sourced from stakeholders and collected in the field (logbook and students' and supervisors' feedback), enhances the credibility of the findings (Gervais 2016; Taber 2013).

To our knowledge, this is the first study to assess optometry core competencies to be achieved during placements to promote competency-based optometric education in Spain. Defining the essential competencies is the first step in the paradigm shift in competency-based education (Eckstrand et al. 2016).In this report, we present the methodology used in this study as a transparent and rational means of developing core competencies for undergraduate optometry programs, based on student requirements and feedback, optometrists in practice and The College of Optometrists of Castilla y Leon Board (Gervais 2016).We report an experience that can be used in other health professions programs and other Universities (inside or outside of Spain).

However, optometry programs (as other health care programs) require an educational design that must provide a balance between the acquisition of knowledge, skills and competencies; including opportunities to integrate these aspects, through engagement in authentic tasks and professional practice with an encouragement of critical reflection on practice and discussion of performance using multiple pedagogical methods (Govaerts2008).

The study is limited by the fact that its findings arose from one placement period within the optometry program of the University of Valladolid (Spain); however this educational research experience could be of great interest to other universities with an interest in developing a competencies-based optometry (or other health care) programs. The number of participants was not large in this study. However, a small number of well-selected participants, as we included in our research, is desirable to avoid questionnaire fatigue (Wilson et al. 2007). Moreover, participating students, professionals, The College of Optometrist of Castilla y Leon Board and placement supervisors guarantee adequate triangulation of the information to provide sound results.

One of the most relevant results of this action-research project is that it allowed detecting 'training gaps' related with essential competencies that are not achieved by a significant number of students. Part of this lack in achievement could be related with the use of non-university centres to provide placement experience where the supervisors were qualified staff that received specific instructions but were not teacher trained. Competencies in this setting could be developed with limitations in regards to time-patient management, number of patients and specialties available in each centre (Hawkins et al. 2015). Because competencies do not exist as independent abilities outside of the patient care context, (Lurie 2012) universities must be able to provide sufficient clinical experience in an adequate pedagogic context where students acquire their competencies supervised by clinically and teacher trained supervisors (Moynihan et al. 2015; Thistlethwaite et al. 2013; Teherani et al 2009; Huddle and Heudebert 2007)in an appropriate environment progressively increasing the number and difficulty of the competencies, because one clinical competence is more than the sum of its sub competencies(Hawkins et al. 2015). Therefore, learners who demonstrate competence in the discrete tasks may struggle when confronted with complex, multifaceted patient presentations in different real clinical contexts (Teherani et al 2009; Malone and Supri 2012). These 'training gaps' may be addressed in future with further research and a new action-research cycle.

Academics involved in the development of health care skills (Saucier et al. 2012), such as optometry and other professions, should encourage the systematic and conscious use of effective strategies related to competency-oriented learning approaches, providing more efficient and meaningful competency-oriented learning experiences in an adequate context. Because the implementation of a competencies-based model takes a considerable amount of time and 'buy-in' from students, faculty, administration, employers, and community partners, more pedagogic and awareness in higher education regarding competencies-based delivery and the role it can play in professional programs is suggested, to address the needs of the 21st century learner (Gervais 2016).

In conclusion, we believe this study shows it is possible to develop topics for inclusion in the core undergraduate curriculum on a rational and transparent basis to improve university programs. The core competencies defined in this study improved the learning experience of final year optometry students at the University of Valladolid. This experience could be useful to other Universities with an interest to move to the competencies-based education paradigm in optometry or in other health professions programs.

Declaration of interest statement, Contributors, Acknowledgments, Funding, and Ethic

Contributors:

RM developed the research questions and study design, conducted literature review, led the focus groups and data analysis, and drafted the manuscript. GR, VJ and SO participated in focus groups, advised on all steps of the data collection, and contributed to the analysis and interpretation of the results. All authors contributed to the critical revision of the paper and approved the final manuscript for publication.

Acknowledgements:

Authors thank to the final year optometry students, supervisors, optometrists and The College of Optometrist of Castilla y Leon Board for their voluntary collaboration to make possible this project. Special thanks to Luisa Simo (University of Plymouth) for her help in final manuscript checking.

Funding: No funding supported this study.

Conflicts of interest: None. No author has any financial or proprietary interest in any material or methods mentioned.

Ethical approval: Not required. Authors follow the principles and recommendations of the 'Ethical Guidelines for Educational Research' and 'Good practice in Educational research writing' of the British Educational Research Association (BERA).

FIGURES:

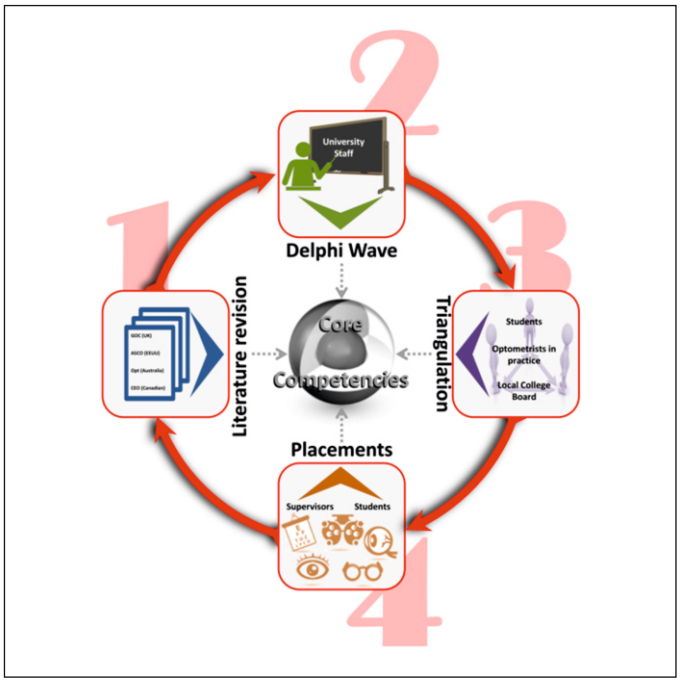

Figure 1.- Schematic representation of the study design.

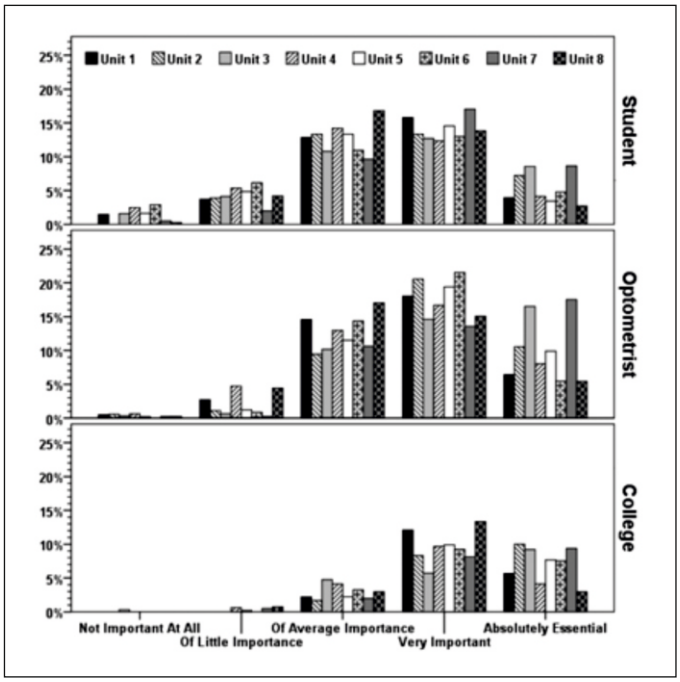

Figure 2.- Frequency of stakeholders' answers to each unit of competencies. Mainly students group classified a few competencies as 'Not Important At All'. Unit 1: Communication; Unit 2: Professionalism; Unit 3: Assessment of Visual Function; Unit 4: Optical Appliances; Unit 5: Methods of Ocular Examination; Unit 6: Ocular Disease; Unit 7: Contact Lenses; and Unit 8: Assessment and Management of Binocular Vision.

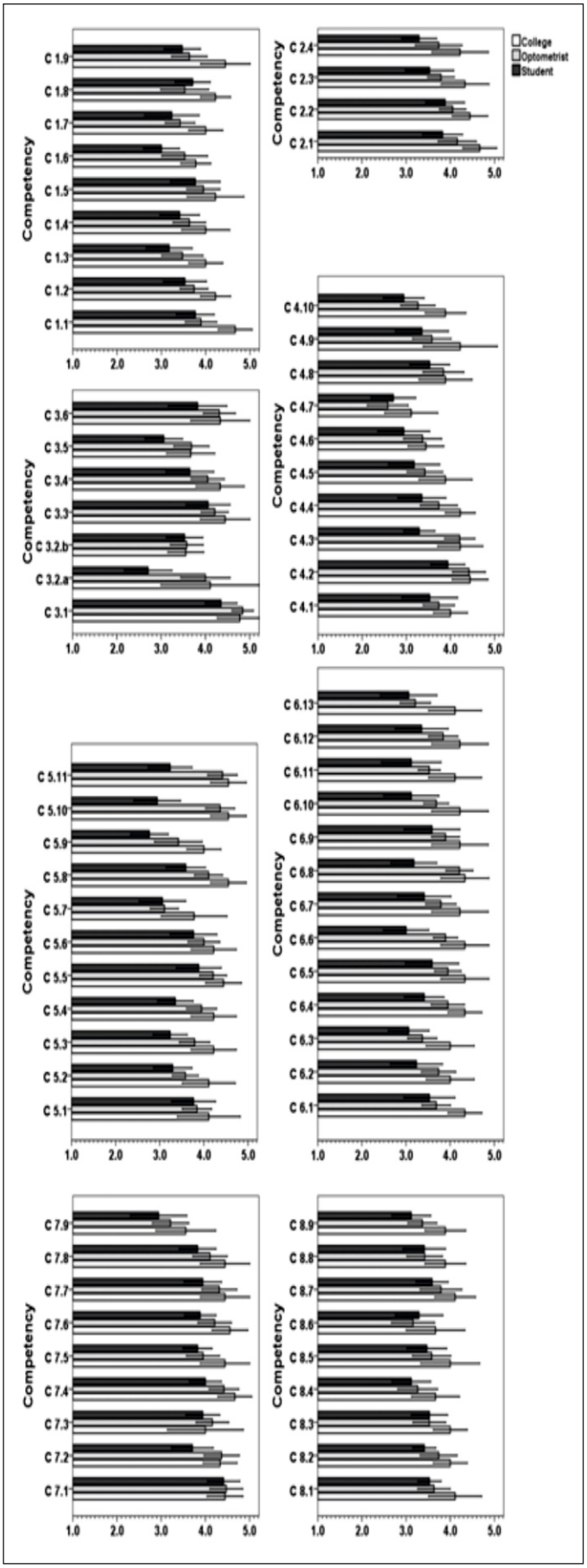

Figure 3.- Summary of competency-by-competency answers of each stake-holder.

TABLES

Table 1.- Participatory action research process and data collection methods.

Activities	Participants	Data Collection Methods
Literature review	Research team (4 optometrists university staff)	Focus group
Delphi survey	4 University Staff (optometrists)	Individual one wave Delphi questionnaire
Assessment of the core competencies by external stakeholders (Triangulation)	Last-year students (n=25) Optometrists in practice (n=20) The College of Optometrist of Castilla y Leon Board (n=9)	Online questionnaire (Likert scale answer)
Placements period development and assessment	Last-year students (n=25) Placements supervisors (n=25)	Competencies-based placement logbook Online satisfaction questionnaire with close and open questions

Table 2.- Core of 72 competencies summarised in 8 major units chosen after focus group and one wave Delphi survey by 4 university optometrists staff.

Core of competencies	
1.- Unit of Competency: Communication	
C 1.1	Ability to obtain relevant history and information in different patients with different conditions
C 1.2	Ability to obtain detailed and relevance of any significant symptoms.
C 1.3	Ability to obtain patient and personal family history.
C 1.4	Ability to obtain particular information relating to general health, medication, family history, work, lifestyle and personal requirements.
C 1.5	Ability to explain to the patient the implications of their pathological or physiological eye condition.
C 1.6	Ability to understand the concern, fears, anxiety and feelings of the patient about their visual welfare.
C 1.7	Ability to inform and discuss with the patient the importance of systemic disease and its ocular impact, its treatment and the possible ocular side effects of medication.
C 1.8	Ability to empathize with the patient, understanding patient's needs.
C 1.9	Ability to integrate and work in team in an optometry and optician environment.
2.- Unit of Competency: Professionalism	
C 2.1	Ability to patient care in a safe, ethical and confidential way.
C 2.2	Ability to create and keep full, clear, accurate and contemporaneous records.
C 2.3	Ability to interpret and respond to patient's existing records.
C 2.4	Ability to work within the law and within the codes and guidelines set by the regulator and the optometry profession.
3.- Unit of Competency: Assessment of Visual Function	
C 3.1	Ability to correctly measure and record the uncorrected and corrected visual acuity.
C 3.2.a	Ability to perform objective refraction (autorefractometer).
C 3.2.b	Ability to perform objective refraction (Retinoscopy).
C 3.3	Ability to perform distance subjective refraction in a range of patients with various optometric problems using appropriate techniques (Donders, Fan&Block, Clock-Test, JCC, Fogging, Duochrome, +1.00, Pin-hole, etc.).
C 3.4	Ability to perform near subjective refraction in a range of patients with various optometric problems using appropriate techniques (accommodation range, grid test, Donders' rule, etc.).
C 3.5	Ability to evaluate colour vision and identify abnormal colour vision appreciating its significance.
C 3.6	Ability to conduct a proper prescription based on the results of the optometric examination and patient's symptomatology.

4.- Unit of Competency: Optical Appliances	
C 4.1	Ability to dispense the most appropriate frame and lens to patient's characteristics.
C 4.2	Ability to measure and verify optical appliances (lensometry) taking into account relevant standards where applicable (prescription, centration, frame details, etc.).
C 4.3	Ability to perform facial measures necessary for the adaptation of ophthalmic lenses (pupil-distance, height, etc.).
C 4.4	Ability to recommend corrective lenses (monofocal, bifocal or multifocal), special lenses (high ametropia), type of lens (glass, organic, etc.) depending on patient's characteristics and needs.
C 4.5	Ability to understand the prismatic effect and modify ophthalmic lenses centration to achieve the desired prismatic effect.
C 4.6	Ability to understand and apply the regulation on eye protection in optometry professional practice.
C 4.7	Ability to understands the application of simple (magnifiers, typoscopes, etc.) and complex low vision aids.
C 4.8	Ability to fit the frame to the patient's facial features during the spectacles delivery.
C 4.9	Ability to manage non-tolerance cases.
C 4.10	Ability to recommend and select color lenses, polarized glasses, etc. depending on patient's needs.
5.- Unit of Competency: Methods of Ocular Examination	
C 5.1	Ability to use the instruments necessary to perform the eye examination, understanding and interpreting the implications of the findings to justify the use of further techniques.
C 5.2	Ability to assess external eye and annexes.
C 5.3	Ability to assess the tear film.
C 5.4	Ability to evaluate pupil reactions.
C 5.5	Ability to use the slit lamp to assess external eye, conjunctiva, corneal, anterior chamber, iris and lens.
C 5.6	Ability to use diagnostic-drugs (fluorescein, etc.) to aid ocular examination.
C 5.7	Ability to examine the fundi using both direct and indirect techniques; assessing the optic disc, cup, excavation, ISENT rule, artery/vein relationship, macula, and periphery.
C 5.8	Ability to measure corneal curvature and assess it's regularity (keratometry, topography).
C 5.9	Ability to investigate peripheral visual fields of patients (confrontation, or computerized perimetry if is applicable).
C 5.10	Ability to investigate central visual fields of patients (Amsler chart, or computerized perimetry if is applicable).
C 5.11	Ability to measure intraocular pressure; analyzing and interpreting the results.
6.- Unit of Competency: Ocular Disease	
C 6.1	Ability to interpret and investigate the presented symptoms by the patient.
C 6.2	Ability to develop a management plan for the investigation of the patient.
C 6.3	Ability to identify external eye alterations or pathology, and offer appropriate advice when patients not requiring referral.
C 6.4	Ability to understand the risk factors for common ocular conditions.
C 6.5	Ability to recognize common ocular abnormalities and disorders; and refer when appropriate
C 6.6	Ability to manage patients presenting with red eye/s.
C 6.7	Ability to manage patients presenting with decreased vision.
C 6.8	Ability to manage patients presenting with cataracts.
C 6.9	Ability to evaluate glaucoma risk factors, to detect glaucoma and refer accordingly.
C 6.10	Ability to manage patients presenting with macular degeneration.
C 6.11	Ability to recognize, evaluate and manage diabetic eye disease and refer accordingly.
C 6.12	Ability to recognize, evaluate and manage patients presenting with symptoms of retinal detachment.
C 6.13	Ability to recognize most common ocular manifestations of systemic disease.
7.- Unit of Competency: Contact Lenses	
C 7.1	Ability to insert and remove contact lenses (soft and RGP) and instruct patients in lenses handling.
C 7.2	Ability to inform on contact lens materials, and to instruct the patient in contact lenses lens handling, cleaning and how to wear and care for them.
C 7.3	Ability to appropriate choice of soft lens parameters (radius, diameter and power).
C 7.4	Ability to assess the fit (movement, centered and vision) and order soft lenses.
C 7.5	Ability to appropriate choice of RGP lens parameters (radius, diameter and power).
C 7.6	Ability to assess the fit (fluorescein, movement, centered and vision) and order RGP lenses.
C 7.7	Ability to manage the aftercare of patients wearing contact lenses (soft or RGP).
C 7.8	Ability to understand the correction of astigmatism with contact lenses; choosing and managing the fitting of toric contact lenses.
C 7.9	Ability to understand the techniques used in fitting complex contact lenses (irregular cornea, orthokeratology, etc.) and advises patients requiring complex visual correction.
8.- Unit of Competency: Assessment and Management of Binocular Vision	
C 8.1	Ability to assess binocular status using objective (Cover Test, etc.) and subjective means (Maddox rod, prisms, and others).
C 8.2	Ability to assess binocular sensorial status using stereopsis, Woth test, and others).
C 8.3	Ability to detect; measure and investigate a heterophoria in a patient.
C 8.4	Ability to manage adult patient with heterophoria (addition, prism, vision therapy, etc.), link together heterophoria and vergence values.
C 8.5	Ability to detect; measure and investigate a heterotropia in a patient.
C 8.6	Ability to manage adult patient with heterotropia (addition, prism, vision therapy, etc.).
C 8.7	Ability to assess the ocular motility (ductions, versions and vergences).
C 8.8	Ability to assess and investigate the response, amplitude and accommodative flexibility.
C 8.9	Ability to understand the management of patients with an anomaly of binocular vision.

Table 3.- Summary of stakeholders' grading responses in each unit of competencies. Students provided lowest score those optometrists in practice and that The College of Optometrist of Castilla y Leon Board (that provides higher score in all competencies' units). These differences were statistically significant (P<0.01) in all competency units. IR: Interquartile Range.

	Mean	Min - Max	Mode	IR	25th	50th	75th
Unit 1: Communication Competency							
Last-Year Students	3.45±0.95	(1.0-5.0)	4.00	1.00	3.00	4.00	4.00
Optometrists in practice	3.64±0.86	(1.0-5.0)	4.00	1.00	3.00	4.00	4.00
College Board	4.17±0.61	(3.0-5.0)	4.00	1.00	4.00	4.00	5.00
Unit 2: Professionalism Competencies							
Last-Year Students	3.63±0.91	(2.0-5.0)	3.00	1.00	3.00	4.00	4.00
Optometrists in Practice	3.93±0.84	(1.0-5.0)	4.00	1.75	3.00	4.00	4.75
College Board	4.42±0.65	(3.0-5.0)	5.00	1.00	4.00	4.50	5.00
Unit 3: Assessment of Visual Function Competencies							
Last-Year Students	3.60±1.08	(1.0-5.0)	4.00	1.00	3.00	4.00	4.00
Optometrists in Practice	4.10±0.87	(1.0-5.0)	5.00	2.00	3.00	4.00	5.00
College Board	4.17±0.91	(1.0-5.0)	5.00	2.00	3.00	4.00	5.00
Unit 4: Optical Appliances Competencies							
Last-Year Students	3.27±1.04	(1.0-5.0)	3.00	1.00	3.00	3.00	4.00
Optometrists in Practice	3.62±0.96	(1.0-5.0)	4.00	1.00	3.00	4.00	4.00
College Board	3.93±0.76	(2.0-5.0)	4.00	1.00	3.00	4.00	4.00

Unit 5: Methods of Ocular Examination Competencies							
Last-Year Students	3.35±0.96	(1.0-5.0)	4.00	1.00	3.00	3.00	4.00
Optometrists in Practice	3.89±0.81	(1.0-5.0)	4.00	1.00	3.00	4.00	4.00
College Board	4.25±0.69	(2.0-5.0)	4.00	1.00	4.00	4.00	5.00
Unit 6: Ocular Disease Competencies							
Last-Year Students	3.28±1.12	(1.0-5.0)	4.00	1.00	3.00	3.00	4.00
Optometrists in Practice	3.75±0.70	(2.0-5.0)	4.00	1.00	3.00	4.00	4.00
College Board	4.21±0.71	(3.0-5.0)	4.00	1.00	4.00	4.00	5.00
Unit 7: Contact Lenses Competencies							
Last-Year Students	3.83±0.89	(1.0-5.0)	4.00	1.00	3.00	4.00	4.00
Optometrists in Practice	4.13±0.85	(1.0-5.0)	5.00	2.00	3.00	4.00	5.00
College Board	4.32±0.76	(2.0-5.0)	5.00	1.00	4.00	4.00	5.00
Unit 8: Assessment and Management of Binocular Vision Competencies							
Last-Year Students	3.39±0.80	(1.0-5.0)	3.00	1.00	3.00	3.00	4.00
Optometrists in Practice	3.50±0.87	(1.0-5.0)	3.00	1.00	3.00	3.00	4.00
College Board	3.93±0.67	(2.0-5.0)	4.00	0.00	4.00	4.00	4.00

REFERENCES

1. [BOE] Official State Gazette. (2009). Orden CIN/727/2009, de 18 de marzo, por la que se establecen los requisitos para la verificación de los títulos universitarios oficiales que habiliten para el ejercicio de la profesión de Óptico-Optometrista.73:26164–9.
2. [ECOO] European Council of Optics and optometry. Guidelines for Accreditation. 2012. Available from: http://www.ecoo.info/european-diploma/information-for-institutions/.
3. [GOC] General Optical Council (2016). Available from: www.optical.org/en/Education/core-competencies-core-curricula/.
4. Eckstrand KL, Potter J, Bayer CR, Englander R. (2016). Giving Context to the Physician Competency Reference Set: Adapting to the Needs of Diverse Populations. Acad Med. 91:930-5.
5. Frank JR, Snell LS, Cate OT, Holmboe ES, Carraccio C, Swing SR, Harris P, Glasgow NJ, Campbell C, Dath D, Harden RM, Iobst W, Long DM, Mungroo R, Richardson DL, Sherbino J, Silver I, Taber S, Talbot M, Harris KA. (2010). Competency-based medical education: theory to practice. Med Teach. 32:638–45.
6. Gervais J. (2016). The operational definition of competency-based education. Competency-based Education. 00:1–9.
7. Govaerts MJB.(2008). Educational competencies or education for professional competence? Med Educ. 42:234–6.
8. Hasson F, Keeney S, McKenna H. (2000). Research guidelines for the Delphi survey technique. J AdvNurs. 32:1008–15.
9. Hawkins RE, Welcher CM, Holmboe ES, Kirk LM, Norcini JJ, Simons KB, Skochelak SE. (2015). Implementation of competency-based medical education: are we addressing the concerns and challenges? Med Educ. 49:1086–102.
10. Huddle TS, Heudebert GR. (2009). Taking apart the art: the risk of anatomising clinical competence. Acad Med. 82:536–41.
11. Kiely PM, Slater J. (2015). Optometry Australia Entry-level Competency Standards for Optometry 2014. ClinExpOptom. 98:65–89.
12. Lurie SJ. (2012). History and practice of competency-based assessment. Med Educ. 46:49–57.
13. Malone K, Supri S. (2012). A critical time for medical education: the perils of competence-based reform of the curriculum. Adv Health SciEduc Theory Pract. 17:241–6.
14. Moynihan S, Paakkari L, Välimaa R, Jourdan D, Mannix. McNamara P. (2015). Teacher Competencies in Health Education: Results of a Delphi Study. PLoS ONE. 10:e0143703.
15. Saucier D, Paré L, Côté L, Baillargeon L. (2012). How core competencies are taught during clinical supervision: participatory action research in family medicine. Med Educ. 46:1194–205.
16. Shilton T, Howat P, James R, Lower T. (2001). Health promotion development and health promotion workforce competency in Australia: An historical overview. Health Promotion Journal of Australia. 12 :117–123.
17. Smythe J, Daum K. (2011). Attributes of students graduating from schools and colleges of optometry: a 2011 report from the Association of Schools and Colleges of Optometry. Optometric Education. 37:5–10.
18. Taber KS. (2013). Classroom-based research and evidence-based practice. 2nd Ed. SAGE Publications Ltd. London (UK).
19. Teherani A, O'Brien BC, Masters DE, Poncelet AN, Robertson PA, Hauer KE. (2009). Burden, responsibility, and reward: Preceptor experiences with the continuity of teaching in a longitudinal integrated clerkship. Acad Med. 84(Suppl10)S50–53.
20. Thistlethwaite JE, Bartle E, Chong AA, Dick ML, King D, Mahoney S, Papinczak T, Tucker G.(2013). A review of longitudinal community and hospital placements in medical education: BEME Guide No. 26. Med Teach. 35: e1340–e1364.
21. Wilson S, Eagles JM, Platt JE, McKenzie H. (2007). Core undergraduate psychiatry: what do non-specialists need to know? Med Educ. 41:698–702.